ELECTRICAL REVIEW

[ILLUSTRATED]

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The Pilsen Electric Light System.

The Pilsen Electric Light Company have had a very important part assigned to them in the lighting of the Health Exhibition, London. The success with which they have executed their work, and the satisfactory manner in which they have maintained their large installation, render the latter worthy of notice. It offers many points of interest to the engineer and the electrician. As an example of progress it claims attention, inasmuch as it includes several novelties, the outcome of experience, and exhibits, partly in consequence, that degree of completeness for which the Bethnal Green installation of the same company is remarkable. The distinctive features of this exhibit will be best understood by setting them out in order.

The dynamos are of the Schuckert type, but the design and construction have been materially modified by the electricians of the Pilsen Company. The exhibits are arranged to show clearly the nature of these modifications and the advantages to which they have led. Of the four machines used to maintain the arc lamps, two, those nearest the eastern end, are of the original form devised by Herr Schuckert. The armature in this design consists of flat wrought iron rings, separated one from another by air spaces, but held together at small intervals by brass rivets and distance washers. Upon the iron core thus built up the wire sections are wound, and the completed ring is mounted upon a metal hub, and secured in position by the friction of metal flanges on either side. The other two machines are of the modified construction of armature introduced by the Pilsen Company, and distinguished as the "Pilsen-Schuckert type." The core of the armature is of soft hoop iron, wound up tightly in volute form. The layers of iron are separated one from another by strips of calico or longcloth wound in with the iron; a sufficient number of turns is given to form the broad, flat ring characteristic of the Schuckert type. The sections of wire are wound upon this ring, and the finished armature is fixed upon the hub in the usual manner. Other machines exhibited are of more recent construction, and these have been further improved in the method of mounting the armature. In these machines the central boss carries a number of radiating arms, terminating in a kind of fork, into which the hoop iron is wound directly. This method of mounting the armature allows the latter to be built up of large diameter. The sections of wire on this ring are separated one from another at the periphery by soft iron shoes or wedges insulated from the rest of the iron in the core. These separate pieces increase in a notable degree the efficiency of the machine. The improvements here indicated, besides affording obvious mechanical advantages, have reduced the internal resistance in the proportion of 12 to 7, while the sectional area of the wire has been increased 40 per cent. The increase of efficiency allows for equal external work a reduction of the speed by about 21 per cent. At the Exhibition each of the original type machines maintains 14 arc lamps through about 400 yards of wire leads at a speed of 775 revolutions a minute. Each of those of the later type maintains 14 arc lamps through about 400 yards of leads at a speed of 614 revolutions. Fig. 1 represents one of the latter machines.

The conductors from each machine are led to a common switchboard, constructed to allow any one of the machines to be in a moment put into connection with any one of the circuits. The advantages of such an arrangement are obvious. Besides this circular switch there are: 1. An ordinary two-way switch for throwing the current, without breaking circuit, into an ammeter for measurement. 2. A solid and cheap form of copper "test plug," by the withdrawal of which an accidental or premature closing of the circuit is avoided. And 3. A water switch, designed to break or close the circuit gradually when the machine is running at a high speed. This gradual action relieves the insulation from the strain to which it would otherwise be subjected by the extra current.

The current meter, which is common to the circuits, is of an altogether novel construction. The form is that of an ordinary flat coil galvanometer, the directive action of whose coils is intensified by the introduction into them of soft iron cores. Between the poles of this electro-magnet rotates a soft iron armature against the tension of a spiral spring. This armature carries an indicator needle, which moves over a graduated dial. The shape given to the poles of the electro-magnet produces equal deflection for equal increments of current. The readings, unlike those of instruments depending upon the action of a permanent magnet, are constant, and the armature is sensitive to extremely small variations of current. As constructed for arc circuits, these meters indicate distinctly variations of one-tenth of an ampere. The iron cores are made to slide in the coils, and they are adjustable with respect to their distance from the armature. The needle is dead-beat. The company's voltameter differs from this instrument only in the winding. A "touch" is added to give security in ignorant hands. Figs. 2 and 3 represent the current meter.

Safety cut-outs or fuses are now a necessary part of an electric lighting circuit. Those of the Pilsen Company possess features which render them both convenient and certain in action. They consist essentially of a group of lead rods held in place by the pressure of a spring against the brass socket into which their ends are set. This snap action not only insures good contact, but allows the fusible rods to be removed or replaced by others, when destroyed by the current, in a few seconds and with the greatest ease. The arrangement permits also the use of a varied combination of fuses, of different areas, through which it is easy to arrive at the exact sectional area of lead required. A large number of these cut-outs are used at the Bethnal Green Museum lighting installation of this company, one in each main circuit, secondary circuit, and branch, in conformity with the stringent requirements of Mr. Musgrave Heaphy, on behalf of the fire insurance offices. Figs. 4 and 5 represent this safety fuse.

The west gallery, in which are the principal exhibits of machinery in motion, is lighted by 28 Pilsen arc lamps of 2,000 candle-power nominal, hung in two parallel rows, one on each side of the gallery. The effect is striking. This arrangement shows to advantage the steadiness of the Pilsen lamp, for an observer stationed at one end of the gallery has the whole installation in view, and the slightest flickering in any one of these

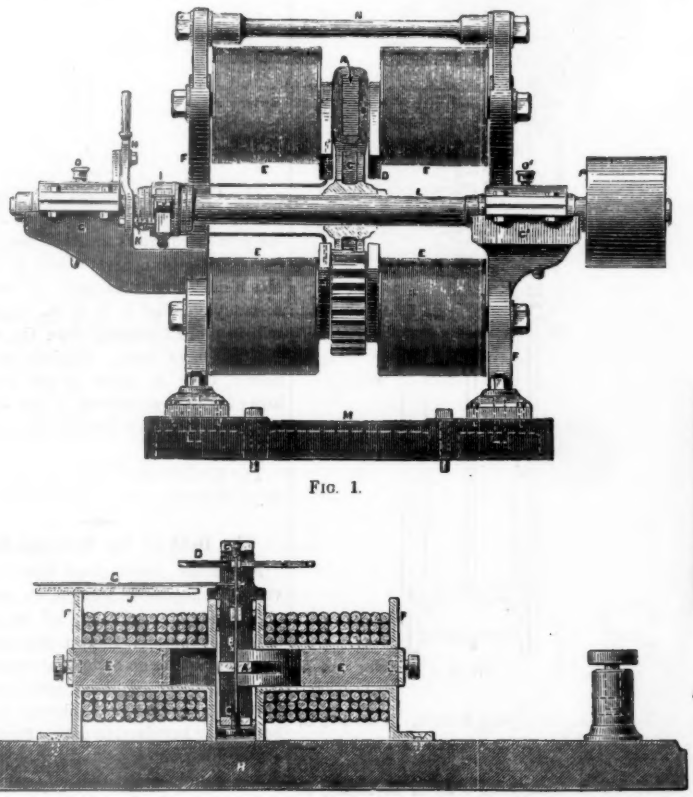


Fig. 1.

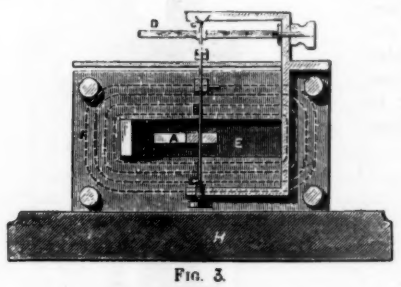
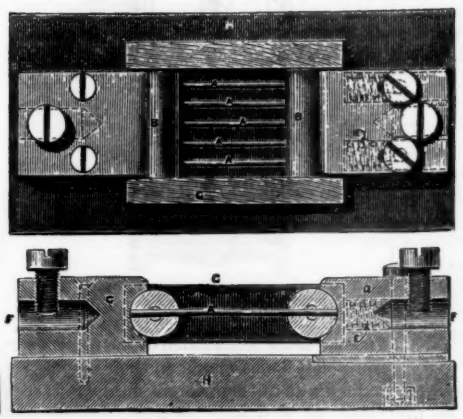


Fig. 3.

Fig. 4



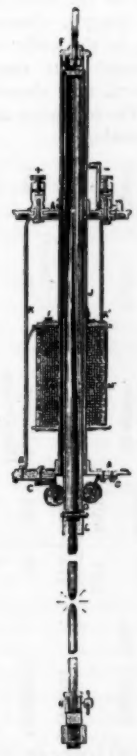


Fig. 6.

The Pilsen Electric Light System.

numerous foci of light would become apparent. These lamps are of the common type known as P^1, the characteristic features of which are the biconical solenoid core and "tandem" coils. Near the machines is exhibited, for inspection of the working parts, another type known as P^3, having two conical cores and parallel coils. A third type, P^2, is also here exhibited. In this lamp there is but one spool, on which are wound both the main and the shunt coils, within which moves a single tapered core. It is claimed for this lamp that it possesses the steadiness of feed distinctive of the other types of Pilsen lamps, while its moving parts are so few that derangement is, with reasonable care, hardly possible. Figs. 6 and 7 show a lamp of the P^2 type. Fig. 8 shows the details of the lamp connections and coils. —*Electrician, London.*

The Electric Light on the Indian Troopships.

It is stated that the six hours' official trials which took place on Monday and Tuesday of last week on board H. M. S. Euphrates mark the completion of the contract which was given to the Edison and Swan United Electric Light Company, Limited, for the lighting of the whole of the Indian Government troopers by the Edison system.

Commencing in May of last year, the company has, says the Portsmouth *Evening News* of the 30th ultimo, during the usual period which elapses between the termination of one trooping season and the commencement of the next, fitted the Malabar, Crocodile, Serapis, Jumna, and now the Euphrates, in the order enumerated, with Edison incandescent electric lamps from bow to stern, and almost from truck to keelson. The following table will doubtless prove interesting:

Name of Ship.	No. of Lamps. Full.	No. of Lamps. Half.	Dynamos.	Engines.	Speed.
Malabar	115	264	2 Edison	2 Brotherhood (3 cylinder)	525
Crocodile	98	288	2 Edison-Hopkinson	Do.	450
Serapis	101	300	Do.	2 Gwynne Invincible	450
Jumna	97	300	2 Edison improved	2 Brotherhood	280
Euphrates	98	301	Do.	Do.	280

Note—Full lamps are of 16 candle-power; half lamps are of eight candle-power on the Malabar, and 10 candle-power on the remainder.

In addition to the above there are on each ship two large reflectors, each containing eight 50-candle lamps, which are intended to be slung to the yard-arms for the purpose of facilitating the operations of coaling ship, embarkation and debarkation of troops, etc., and are also found to furnish a charming illumination for the impromptu concerts and dances with which the ladies and officers relieve the monotony of their passage to India or home. The Crocodile is in addition fitted with mast-head and port and starboard lights of 50 candles.

No better instance could be quoted of the vast strides towards perfection which electric ship-lighting has taken during the past 18 months than these admirable installations. Starting with the Malabar, the electric machinery of which runs at 525 revolutions per minute, whilst each dynamo is capable of sustaining but 150 full lamps, the speed has progressively been reduced to 450 on the Crocodile and Serapis, and 280 on the Jumna and Euphrates, whilst one dynamo is now capable of sustaining the whole of the lamps in each of the four latter ships, thus allowing the other machine to be held in readiness in case of any accident; indeed, on the Jumna and Euphrates, one machine is found amply sufficient to keep the two yard-arm reflectors going, in addition to the total lighting of the ship.

Again, owing to the lesser electromotive force required on the eight-candle lamps of the Malabar, it is there impossible to substitute full for half lamps, or *vice versa*, whilst on the remainder all lamps take equal electromotive force, and it is therefore practicable to change the amount of light at any particular spot to suit the convenience or necessity of the occasion. The great advantage of being able to more than treble the lighting of the engine-room, for instance, in the event of a break-down occurring, is a boon which cannot be over-estimated.

Another improvement over the first installation has been effected in the remainder by placing the lights in each cabin instead of in the pilasters, and we understand that it is contemplated to make this alteration, together with the substitution of half lamps of equal electromotive force to the full ones, on the

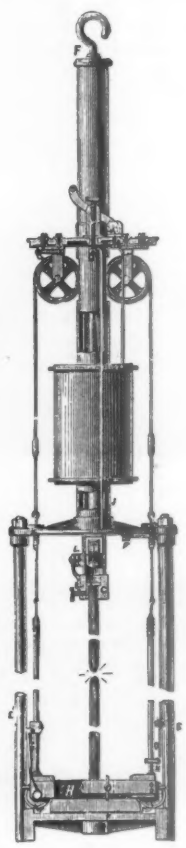


Fig. 7.

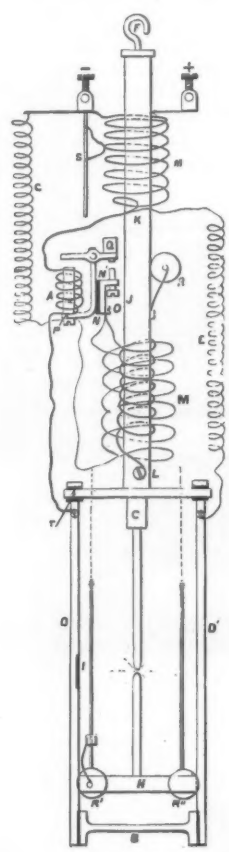


Fig. 8.

Malabar at the termination of the present season. The saloons, engine and boiler rooms, are lighted with full lamps on all ships, whilst each cabin and mess table has a half lamp allotted to it. In each cabin there is a small switch, controlling its lamp, so that the occupants can obtain light at any moment during the night, or extinguish it at pleasure, whilst the mess table lights are controlled in groups, thus enabling the "lights-out" rules of the service to be complied with, a certain number of lamps remaining alight throughout the night as police lamps.

Considerable improvements have been likewise effected in the wood casing, which covers the wires, which now appear able to stand not only the most severe deck washing, so dear to the heart of a blue-jacket, but also the intense heat of the stokehole.

A noticeable feature is the complete safeguard against fire by damage to the electric wires, which is attained by the insertion of a short piece of lead wire in the circuit of each individual lamp and main group of lamps, which is calculated to fuse long before, a dangerous elevation of temperature, through any cause, can be set up in the wires.

In the direction of cost the superiority of electric light has proved most marked; for with a vastly increased amount of light the cost of the purser's dip has been beaten by 50 per cent., actual trial having proved that where considerably over £200 was expended on oil and candles, the electric light has cost but little over £100 to maintain, the item of renewal of lamps through failure of the carbon loops having proved exceptionally small; an average life of 4,000 to 5,000 hours actual burning having been attained through the care in manufacture taken by the company, and the rigid tests for the detection of faulty lamps which they make before issue from their factories, in which the immense number of 6,000 to 8,000 per week are produced. The whole of the work has been carried out to the complete satisfaction of the Dockyard officials—who have closely scrutinized it during its progress, and severely tested each ship as completed—by Mr. Douglass C. Bate, A. S. T. E. and E., assistant engineer of the contracting company.

The Oregon and America both left New York on Wednesday, the 8th of October, and both arrived at Queenstown on the 15th following, the Oregon running a distance of 2,819 knots, occupying 6 days, 12 hours, 37 minutes, which gives a speed of 18.01 knots per hour, the America running a distance of 2,777 knots, occupying 6 days, 17 hours, 43 minutes, a speed of 17.14 knots. The Britannic left New York on October 11th, and arrived at Queenstown on October 19th, after running a distance of 2,852 knots in 7 days 12 hours 17 mins., which gives a mean average speed of 15.85 knots, thus occupying, say, one day longer than the Oregon, and about 18½ hours longer than the America. By these figures it will be seen that in a period of ten years a gain of one day has been obtained in crossing the Atlantic; and assuming that the consumption of coal of each ship was per day respectively 265, 185, and 100 tons, to gain this one day the Oregon burned about 1,656 tons, and the America about 1,174 tons on the passage home, whereas the Britannic burned only 750 tons.

If we consider that in the case of the steamer Oregon it was necessary to burn 906 tons to gain 24 hours, and in the case of the America 424 tons to gain 18½ hours on the Britannic, it may well be asked: "Do the new steamers possess the same efficiency as the old?" Looking at the wonderful performance of the Britannic, and her sister ship the Germanic, during the past ten years, it seems as if they yet could be made to compare with their newer rivals in speed by increasing the power of their machinery in but a moderate degree, as it is plainly evident that their superior model serves them in good stead; and considering that the Britannic's last homeward passage is—if we are not mistaken—the fastest she ever made, the strength of hull would be amply sufficient to allow of the increased power being supplied, which the extensive use of steel would permit, to suit the existing portions of the ship.

When, then, the boilers of these steamers require renewal, it should be seriously weighed whether or not it is advisable to replace the existing machinery, excellent though it be, with either triple expansion or ordinary compound engines of such power as to increase the speed to 18 knots. In order to place more clearly before our readers how much it requires to obtain so little, the following table, showing the relative horse-power, etc., will be of interest,

	Fastest Passage. Dys.	Hrs.	Mins.	I. H. P.	Consumption.	Ton	Speed.
S. S. Oregon...	6	12	27	12000	265 tons.	7250	18. knots
" America.	6	17	43	9900	185 "	5530	17.1 "
" Britannic	7	12	17	4900	100 "	5004	15.8 "

The Umbria, the latest addition to the Cunard fleet, attained a speed of 20 knots on the measured mile, and is, if we exclude torpedo boats, the fastest vessel in the world. Much curiosity is felt as to the result of her first voyage, and it is to be hoped that she will be more fortunate than the Oregon and Austral have been. Engines of enormous power, such as those of the Umbria, are, however, still somewhat in the experimental stage, and broken pistons are not unknown among them.

The Umbria made the passage over in 7 days 16 hours; about 15 1-3 knots per hour.

The Debt of the Mexican Republic.

Erroneous impressions have so long prevailed concerning Mexico, its resources, social condition, stability of its government and other matters, that it has come to be a matter of common belief, inculcated by many of the papers of the United States, that Mexico is an almost bankrupt country, and hopelessly involved in debt. Facts, however, are stubborn things, and in the present case prove conclusively that of twenty-two nations, many of whose resources and prospects are greatly inferior to those of Mexico, the latter country is to-day really the least involved in debt, as the total public debt of Mexico, as contrasted with that of other nations for the last attainable year will show, as follows:

France	$4,683,840,000
Russia	4,314.607,599
Great Britain.....	3,814,500,000
Italy.....	2,042,000,000
United States.....	1,918,312,994
Spain	1,826,613,093
Austria-Hungary....	1,685,424,276
Germany.....	1,349,728,232
British India.....	765,673,425
Turkey.....	532,186,170
Egypt	529,383,150
Australasia.....	449,551,245
Portugal	430,879,399
Brazil.....	409,866,550
Netherlands.....	376,523,380
Belgium.....	341,917,662
Japan.....	311,294,347
Paraguay.....	251,000,000
Peru.....	141,650,000
Canada.....	199,861,537
Roumania.....	125.727,822
Mexico....	125,000,000

The Lighting of the "Colossus."

Since the Brush Company has turned its attention to incandescent lighting it has been fortunate in securing the lion's share of the Admiralty orders, and has justified the choice of the authorities by the erection of some first-class installations on shipboard. In the Victoria dynamo it possesses a machine which is eminently adapted for marine use, because from the comparatively large diameter of the armature a great peripheral speed is obtained at a slow rate of rotation, and hence direct driving can be adopted without the engines being pressed unduly. The use of four or six poles is also another advantage, and very greatly increases the output of the generator without adding to its size or complexity. These two features, combined with first-class workmanship and the minimum of sparking, recommend the Victoria machine for all kinds of work, and particularly for use in places where space is valuable, and where a breakdown may be almost a matter of life and death. In naval warfare the great engine of defence against torpedo attack is vigilance, but in the dark it is exercised at such great disadvantage when the most important sense of sight is almost inoperative, that the odds turn in favor of the enemy, unless the whole area about the ship be incessantly patrolled by guard boats, a practice which exceeds in weariness and exposure the detested sentry-go of the garrison soldier. The electric light, however, restores to the look-out the faculty of vision and he can sweep the sea, often for miles, with the certainty of detecting anything larger than a wherry. It is, therefore, important that the means of defence, which vies in utility with other portions of the armament apparently much more formidable, should be secure against all chance of breakdown, as it is matter of universal experience that if a hitch occurs it always happens at the most critical moment. In the Colossus, the latest and most complete Brush installation afloat, there are three dynamos each driven by an independent engine, and as long as one of them is intact, it will maintain either one or two search lights. There are three Mangin projectors on board the ship, two forward and one aft, and any of them can be connected to either of the generators at will. All the machines have their magnets compound wound, as they are also used for incandescent lighting, and they are found to answer extremely well for the hand lamps of the regulators, which, of course, are liable to irregularities in the feed from inattention or unskillfulness on the part of the attendant. If the arc becomes excessively long the excitation of the shunt coil maintains the electromotive force, which would rapidly drop in a series wound machine, and if the arc breaks and has to be re-established, the influence of the series coils aids the process, which, is sometimes difficult in a shunt-wound machine.

Of the three machines, one is designed to feed the search lights, one to illuminate the interior of the ship, and one to be held in readiness to replace either of the others. Six circuits proceed from the engine-room; two lead to the projectors, one to the citadel, one to the engine and boiler-rooms, one to the officers' quarters, and the last is the fighting circuit. Each dynamo is capable of feeding 200 lamps of 20 candle-power each, and gives a current with an electromotive force of 80 volts. Many of the lamps, however, are only of 10 candle-power, these being used for the mess tables, officers' quarters, and for general illumination. The deck is lighted by two yard-arm reflectors, each containing eight lamps of 40 candle-power with flexible leads, which allow them to be suspended at any point. The connections for these are made at a terminal box on the superstructure. The whole of the lamps and globes are protected from the concussion caused by the fire of the large guns by the spring arrangement described at page 255 *ante*. Those in the cabins and staterooms are inclosed in lamps illustrated in Fig. 1 (page 481), while the lamps exposed to rough usage are protected by gratings, as shown in Figs. 2 and 3, the former being intended for attachment to a bulkhead, and the latter to the deck above. In many parts of the ship sockets are provided to which flexible conductors can be attached, and thus the lamp can be moved about over a considerable area (Fig. 4).

The application of the electric light to every one of Her Majesty's vessels of war cannot be long delayed now. The navies of foreign powers will be accompanied by a cloud of torpedo boats, and in the event of war, their moral effect against ships not perfectly equipped against their attacks, will be far more formidable than their power for evil would warrant. The stage of experiment as regards generators and lamps has passed, and there can be no excuse for further delay on that score. One point, however, still remains for improvement. The projector offers a good mark for a shot, and a very slight injury would be fatal to it. It is difficult to see how this is to be avoided except by the use of reflectors, a method which entails a large loss of illuminative power. Something, at any rate, might be done by means of shields to lessen the area exposed, and to render the position of the attendant less perilous. Of course there is little fear of shots fired from a torpedo boat, but if two vessels engage in a duel at night the one who could extinguish her adversary's light would have a great advantage, as the machine guns of her antagonist would then be fired entirely at random, and many operations could be safely attempted which would be instantly repressed or defeated if they could be seen.—*Engineering*.

FIG. 3.

FIG. 1.

FIG. 2.

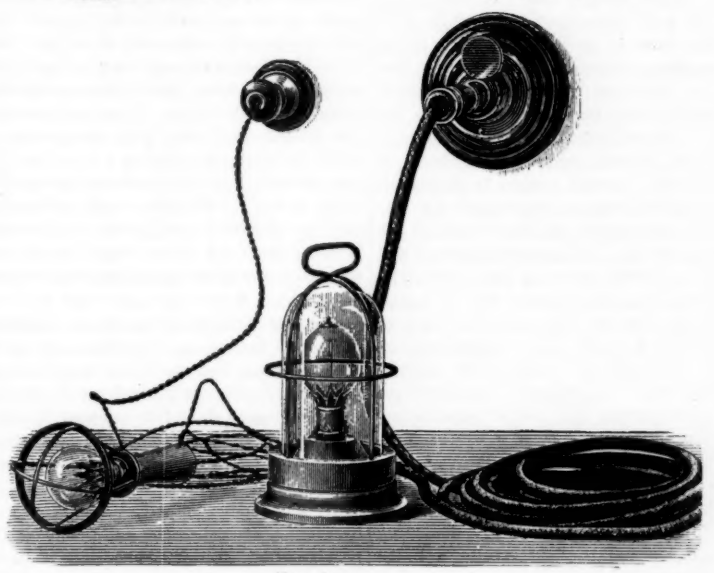


FIG. 4.

Heroic Act of a Brooklyn Lineman.

JOHN CALLAHAN SEVERELY HURT AT HIS POST OF DUTY.

Frank Allen and Thomas Fitzpatrick, linemen in the employ of the Long Island Telephone Company, were engaged Monday in readjusting the wires at the top of an 80-feet pole on Washington and York Streets, Brooklyn. Allen, who is an experienced lineman, had hardly reached the top when a crowd below who had been watching his rapid ascent raised a cry of alarm. He had laid himself suddenly along one of the cross-arms, and was clutching it convulsively. Fitzpatrick dashed up the pole like a raccoon. Allen was limp, and Fitzpatrick found him unconscious in a fit. Balancing himself and Allen with his left hand, Fitzpatrick released a rope from his waist with his right hand and lashed him lightly to the pole. He then descended amid the cheers of the crowd, now increased to over a thousand people. Allen was finally taken off the pole by firemen, with the aid of a hook and ladder truck.

Another splendid example of bravery and devotion to duty, which may cost the modest hero his life, was shown during the storm of Sunday night on the Hudson River Railroad.

A few minutes after eight o'clock, as the Chicago express, bound for New York, thundered out from the south end of the tunnel through St. Anthony's Nose, an explosion of torpedoes warned the engineer and passengers that danger was imminent. The train was soon stopped and an investigation made. The violent gale which was raging, and the splashing of the river close by the train, first suggested that the track had been washed away, but it was soon discovered that the signal tower at the Highland's station had been blown down and lay across the track, and under its ruins lay the body of John Callahan, the brave signal man, who had faced death to perform his duty.

Efforts were first made to extricate the body, and willing hands made as quick work as possible. The poor fellow was still alive. He was removed into a baggage car, and all was done for him that was possible. Before the wreck was cleared away, he recovered enough for the train officers to learn something of the occurrence. It was gathered from his occasional attempts at explanation that the gale shook the signal tower so severely that he was sure it would go over. He went up the road and set the torpedoes. Then he returned to the tower to attend to his signals, and was buried in the ruins when the gale demolished the structure.

How long before trains arrived at the spot the torpedoes had been set and the tower blown down, was not ascertained.

Callahan's condition is precarious. A handsome sum was raised for him by the passengers on the train.

The Right to Erect Telegraph Poles.

REPORT MADE UPON THE SUBJECT BY CAPT. GREEN AND ATTORNEY RIDDLE.

Senator Edmunds, having protested against the erection of telegraph poles in the alley in the rear of his premises, 1411 Massachusetts avenue, in Washington, and questioned the authority of the Commissioners to grant permission to erect such poles, the matter has been the subject of considerable correspondence between District officials. Captain Green reported that the telephone company was permitted to erect these poles in the alley, on condition that they should move the poles on 14th street, between L and N. He suggested that the authority of the Commissioners should be settled by a test case in court. Mr. Riddle, the attorney of the District, has given an opinion upon the legal aspect of the case. He says the power of the Commissioners to grant such permits is supposed, by implication at least, to grow out of or to be a part of the general grant of control over the streets, avenues and alleys of the district, conferred upon the late board of public works, and from that devised to the Commissioners. The Revised Statutes, D. C., forbid the use, he says, of any part of a street or avenue by private persons for any private purpose whatever. He claims that the setting up a telegraph pole on a street is for a private purpose. After referring to other laws relating to the streets, and applying likewise, as he claims, to the public alleys, the attorney gives his opinion that the Commissioners cannot control the streets for any other purpose, except to repair them. He doubts whether any subordinate power can devote the streets or alleys, or any part of them to any other use than the public use, to which they were dedicated by Congress. He suggests also that the matter could be tested in court if some one would prosecute the company for setting up one of these poles. The company would set up the permit of the Commissioners as its warrant. In addition to Senator Edmunds' letter, protests of a similar character have been received from Messrs. George Taylor and F. W. Hackett.

On a recent visit to Providence, R. I., we visited the factory of Mr. Wm. T. Smith, who manufactures blue vitriol, especially for battery purposes as used for telegraph, telephone, railway and fire-alarm signal service. This blue vitriol is manufactured from pure copper and acid, and contains no iron or other impurities to foul the batteries and thus weaken the current. He also is very particular that he ships no goods containing free acid or dust, and carefully sorts the crystals to any size required for different uses. He also buys copper precipitated by batteries and copper and blue vitriol sediment of all kinds.

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NEW YORK, DECEMBER 20, 1884.

CONTENTS.

	PAGE
The Pilsen Electric Light System	1
The Electric Light on the Indian Troopships	2
The Debt of the Mexican Republic	2
The Lighting of the "Colossus."	3
Heroic Act of a Brooklyn Lineman	3
The Right to Erect Telegraph Poles	3
Editorial Notes	4
Future Telephonic Improvements	4
An Electric Light Convention	4
Are Lines of Magnetic Force Visible?	4
Editorial Notes from Boston	5
Telephonic News	6
Telephone Transmitters	6
Canadian Government Telegraph Lines	7
Telegraphic News	7
Electrical and Scientific	8
List of Officers and Directors of the Western Union Telegraph Company	8
Burton Electric Heater	8
Pratt's High-Speed Indicator	8
New Incandescent Lighting in Antwerp	8
The Davis Positive-Action Cut-out and Contact-Changer	8
Electric Light News	9
Electrical Patents	10

One of the most brilliant gatherings held in New York this winter was the occasion of the annual dinner and reception of the "Old Guard," at Hotel Dam, on Saturday evening last. The members were all present and many distinguished guests. The organization is composed of the old pioneers in the telephone field and a number of prominent electricians. The old officers were all re-elected. Maj. L. N. Downs, President; Col. J. N. Keller, Thomas B. Doolittle and Wm. D. Sargent, Vice-Presidents; F. B. Knight, Adjt., and Dr. H. A. Bunker, Surgeon. Col. Geo. L. Beetle was chosen poet.

Many interesting discussions and speeches were made, notably the one by Col. Beetle in presenting on behalf of the "Old Guard," an elegant diamond ring to the editor of the REVIEW for some special service attributed to him in the organization of the society sometime since. This act of the society indicates the very thrifty condition of its exchequer, and it is without doubt one of strongest and best organized of any of the electrical societies in the country to-day. The members from New England and the West remained until Wednesday to visit the principal points of interest in the city.

It seems that the Minister of Agriculture of the Dominion of Canada, before whom the question was argued, decided that the evidence placed before him was not sufficient to warrant him to declare the Bell patents in Canada void. It was claimed that by failure to manufacture within the Dominion, and by importing patented apparatus for use in Canada, the local Bell Company had forfeited its rights to its patents. This is the second victory which the Bell interest has scored within the present month.

Over-capitalization and "kite-flying" have had much injurious effect upon electrical industries in this country, but not a tithe of the damage they have done in England and on the continent of Europe. In "ballooning," we in America are mere babies compared with our British cousins. And just as the inflation is greater, the collapse is more disastrous. Electric lighting, which was in many localities in America severely crippled, has been practically killed outright in England, and is dead past all possible resurrection. But here, owing to our comparative conservatism, electric lighting has long been looking up, and is proving itself what many said it never could become, a substantial, legitimate and remunerative industry. The consumption of carbons, a fair measure of the extent to which arc-lights are used, is greater to-day than ever before, and the number of plants for incandescent lighting is steadily increasing.

FUTURE TELEPHONIC IMPROVEMENTS.

Now that a leading source of annoyance, the Drawbaugh suit, is out of the way, the American Bell Telephone Company can devote all its energies to extending its business, and improving in every way the quality and value of the instruments covered by its patents. So far as the extension of its business is concerned, it may, in a certain sense, be said to be largely a matter of routine. Its policy and methods have all been mapped out and determined, and while it is true that there is an infinite amount of detail requiring constant attention, it is also true that few large questions are involved, and that the work may mainly be left to the officers to whose departments it properly belongs. At present, therefore, the charm of novelty and of interest centers in the experimental and mechanical department, for it is here that inventions and improvements are to be looked for. An improvement that will better the service for each and every telephone subscriber the country over, is a matter of the greatest importance, in view of the fact that it would render telephony more popular and tend to increase the out-put of instruments. A change or improvement that would reduce the cost of manufacturing instruments would be of a value too potent to require explanation. A change in construction, which, without increasing the cost, would increase to twice or thrice the "life" of a transmitter would, considering the immense number now in use, and the much greater number likely soon to be in use, be a factor so important as to have a decided bearing on dividends. The invention of a perfectly simple, economical and absolutely reliable "protector," sure in every case to cut off lightning and electric light currents, which have been a frequent cause of injury to transmitters and other instruments, and have more than once thrown a whole exchange into disorder, is a matter of prime importance, and it is gratifying to know that it has been accomplished. The device—it can hardly be called an instrument—is simplicity itself, yet, under the severest tests that the electricians of the Bell Company have known how to apply, it has not, in a single instance, failed to protect the instruments over which it stood guard.

It is interesting to know that the Bell Telephone Company, which has always cherished and fostered its experimental department, sparing no expense that could possibly be of use, realizes its importance so fully, that it has employed Mr. Thomas A. Edison to give all his unoccupied time to its service. He is already at work, in the old, sanguine, enthusiastic yet careful way, and "the boys" who are about him, say that "the old man"—this is their affectionate way of speaking of one who is the junior of most of them—has already got "blood in his eye." It is certainly a wise thing on the part of the company to employ Mr. Edison, and it must as certainly be a pleasant thing for Mr. Edison to be so employed. No man is so thoroughly equipped for the work, and no living electrician has such facilities for carrying it on. His electrical library is without a parallel, and his laboratory affords every possible convenience that he, with ample means at his command, has been able to think of. We look for important results from this new alliance, and look for them confidently.

AN ELECTRIC LIGHT CONVENTION.

It has been suggested in our columns that representatives of the various companies throughout the country meet in convention at some central point and compare notes. There are many reasons why such a meeting is desirable. The art is new, and no manager of an electric light company can anywhere be found who is not ready to admit that he has much to learn. It is not so much that it is desirable to discuss and compare existing "systems"—comparisons are always odious—but that it is important for men who are carrying on the lighting business in widely scattered localities to come together and render mutual help by giving one another the benefit of their practical experience. Granting that in one city the local company is using, and will continue to use, Brush dynamos; that in another no suggestion of anything but a Weston machine will receive attention; and that a third is for all time wedded to the Thomson-Houston dynamo and lamps; and that any discussion of the relative value of these three systems is out of place and uncalled-for between their several representatives, is it not still true that many subsidiary but all-important questions remain which might be profitably discussed? Nor need the work be confined to arc lights. Besides the Edison Company—which, up to the present time, uses them exclusively—the Brush, United States, Thomson-Houston, and several other companies are at work in the incandescent field, all in a more or less tentative way, and all admitting that there is much to learn. Whatever their differences may be, however strong the competition between them, all electric light companies, whether engaged in a manufacturing or lighting business, know and agree that it is for the interest of them all that electric lighting should be cheapened, simplified, and made more popular; that the public mind should be educated and enlightened concerning it, and that means should be adopted to eliminate from it whatever sources of danger may inhere in it. It is known that the cheapening of the light is to be effected, if at all, by better and more economical use of power, by numberless little economies, and by improved administration. These apply to all systems, and are legitimate subjects of discussion among representatives of all. Still steering clear of dynamos and lamps, experience has taught much in the way of simplification and improvement of subsidiary apparatus. It is proper and becoming, too, that electric lighting companies should take into consideration methods of freeing the public mind from misconceptions, largely the result of false statements set afloat by interested parties, concerning dangers from electric lights and lighting currents, and it is certainly desirable that the joint experience of all should be placed at the disposal of all to aid in averting whatever actual danger to life or property really exists in connection with lighting.

We do not presume to suggest, except in this rough outline, the work which such a convention could and would accomplish, but we are convinced that its influence could and would be only for good. It should be held in some centrally-located city—say Chicago—and the general outline of its work should be planned beforehand by some committee—self-appointed, if need be—representing all interests fairly and equally.

We shall be glad to receive from any one interested any information or suggestion on this subject. We shall be glad to render any assistance in our power towards bringing about such a convention, believing that it will tend to promote the interests of electric lighting companies throughout the country. And we shall be glad to receive and turn over to the proper persons, letters from companies expressing a willingness to send representatives to such a convention. If a sufficient number of companies would express such willingness in advance, the holding of such a convention and its success would be foregone conclusions.

ARE LINES OF MAGNETIC FORCE VISIBLE?

It is known that it has been claimed by Reichenback and others that the lines of magnetic force which surround and radiate from the poles of an electro-magnet, and even of a permanent magnet, may, under certain conditions, and by certain persons, be found to possess a peculiar, unexplained faculty, be readily seen and described. The Society for Physical Research, of London, took up the subject, and in the 5th number of their "Proceedings" we find an extended preliminary report from a special committee appointed by the Society to inquire into this and related phenomena. The committee consists of W. F. Barrett, F. R. S. E.; Rev. Maxwell H. Close, M. A.; St. George Lane Fox; Edmund Gurney, M. A.; Frederic W. H. Myers, M. A.; A. T. Myers, M. D.; Edward R. Peaše; Henry N. Ridley, M. A., F. L. S.; W. H. Stone, M. A., M. B.; and Walter H. Coffin, F. L. S., F. C. S., *Hon. Sec.* In the opening part of their report the committee say: "If a luminous effect of ordinary magnetism, though rarely seen, is, as Reichenback believed, an actual physical phenomenon, and demonstrable as such, its establishment would not only have a high scientific interest outside the main objects of this society, but distinctly lend importance and a high degree of credibility hitherto wanting to his description of correlative and less purely objective phenomena.

In order to apply the test, a room on the society's premises, measuring about thirteen feet square and twelve feet high, was so arranged as to be absolutely dark. "On a bright, sunny day," says the report, "prolonged immersion in the *camera obscura* fails to reveal to any eye the faintest glimmering of ordinary light." It is unnecessary to describe in detail the extreme precautions taken to obtain absolute darkness, it being sufficient to say that the experiments were in the hands of scientific men, fully alive to the importance of absolutely correct conditions, and fully competent to secure them. Photographic and all other known tests were applied, and failed to reveal the presence of the least particle of light. In this room was placed an electro-magnet, "with limbs about eight inches long, the same distance apart, of flattened section of 2¼x7 inches, reduced to 2¼ in circular at the polar surfaces, the whole 24 inches length of the magnet being wound with wire, and so mounted on trunnions in a massive wooden stand that it could be inclined and clamped in any position. It was exerted by the current of eight large (10 by 6 inch plates), Smee cells, led to it from a commutator (that is a contact-maker and circuit-reverser), in the adjoining room."

After careful and repeated trials with 45 persons of both sexes, of ages ranging from 16 to 60 years, only *three* professed to see anything, a much smaller proportion than should according to Reichenbach, have been found. But, in determining averages, a very much larger number than 45 must be investigated. The interest centers in what these three "sensitives" professed to see, and the proof that they saw it.

A Mr. Smith, a young man of 19, and a

lad, Fred Wells, were, on the evening of January 2d, 1883, seated in the dark room with several of the committee. The large electro-magnet was in the middle of the room with the poles upward, and about 4 ft. 6 in. above the floor. This was magnetized at intervals, but for the first half hour without being observed. At the end of that time both sensitives described something in the center of the room, as, in their own words, "more like a faint smoke than a light," and successively led Professor Barrett's hand directly to the poles of the electro-magnet as its source. The "commutator," which made and broke the current, animated the magnet, worked quite silently, and was in charge of three of the committee in an adjoining room, where every remark of the "sensitives," or of the committee, could, through the darkened screens, be distinctly heard. The current was suddenly and unexpectedly broken, when Smith said instantly "It is gone," (alluding to the smoke or faint light described), and it being as suddenly remade in a few seconds, he exclaimed as quickly, "Now I see it!"

The experiments were then continued at great length. From time to time the observers in the adjoining room silently and unexpectedly, and at irregular intervals, closed or opened the circuit, but in every case, except one, the exclamations made by Mr. Smith were absolutely simultaneous with the movement of the commutator, In the one case referred to, there was a delay of five seconds. It should be stated that Mr. Smith had no previous knowledge of the nature of the experiment to be tried, and that, to prevent the possibility of deception, his person and pockets were searched for any possible concealed apparatus. Of course the magnetic "tick," due to molecular crepitation, when the current about a magnet is made or broken, was not forgotten. Prof. Barrett, who knew just what to listen for, and just how to listen for it, failed to detect the slightest sound in the "making" of the circuit, and only a barely audible "tick" when his ear was in actual contact with the magnet itself or its support. At the distance at which Mr. Smith was placed, hearing this tick was absolutely out of the question.

The description given by the three "sensitives" (including a Mr. Beard, in addition to the two mentioned) of the luminous appearance was that of two rounded or blunted cones, apices downwards, one of each being directly over and upon a pole of the magnet. They were described as wavy, unsteady in form, and flickering or variable in intensity. The breath deflected without extinguishing them.

According to two of the observers with whom the experiment was tried, the luminosity was not intercepted or cut off by a black velvet cloth or thick board laid flat over the poles, but was hid from view like an ordinary source of light by an opaque body between it and the eye.

Faint lights were described by one of the "sensitives" on permanent steel magnets, and in particular upon a small laminar "Jamin" magnet having a concentrated intense field; "but the tests to which the committee have as yet put these are not entirely conclusive."

Another branch of the investigation concerned sensations other than those of sight produced by an electro magnet. Not only two of the "sensitives," but one of the committee as well, experienced peculiar sensations in the face and head, which appear to be due to their being in the magnetic field. The member in question, placing his forehead exactly between the poles of the magnet, was able to distinguish perfectly, and, according to his account, by peculiar sensations in the head and face, whether the current was "on" or "off." Mr. Smith, in the light, and in the presence of the committee, with his face in the strongest part of the magnetic field, accurately announced, within one or two seconds in each case, *twenty-one* successive "makes" and "breaks" of the current. In summing up the result of their investigatious, the committee says:

"On the whole, while undoubtedly the evidence is yet too slight to draw more definite conclusions, the committee feel at least justified in recording:

"*Firstly*, that three observers, separately, on distinct occasions, were in some way immediately aware when an electro-magnet was secretly "made" and "unmade," under such precautions as were devised to suppress ordinary means of knowing, and to exclude chance and deception, and identified such magnetization with luminous appearances, which, as described, agreed generally with the evidence recorded by Reichenbach; and,

Secondly, that there were, though less decisively, indications of other sensory effects of magnetism.

"In view of these apparent confirmations of previous testimony, the committee incline to the opinion that, among unknown phenomena associated with magnetism, there is a *prima facie* case for the existence, under conditions not yet determined, of a peculiar and unexplained luminosity resembling phosphorescence, in the region immediately around the magnetic poles, and visible only to certain individuals."

Here is a field of research, neither difficult nor expensive, to experiment in, into which o me of our American electricians might look. It may be that it promises no pecuniary return but it certainly has the merit of being interesting, and what it may or may not lead to no man can say. That the phenomena exist, under certain conditions, seems practically proved. What those conditions are, and what laws control operation, to make this light visible to some and invisible to others—these are the things to be studied out. Careful, unprejudiced investigation, coupled with legitimate reasoning, is sure to get at it in time.

EDITORIAL NOTES FROM BOSTON.

Suggestions of a possible consolidation of the three electric light companies doing business in Boston are finding their way into the papers here, and seem to meet with public favor. The companies have had enough to contend with without fighting each other, and it is beginning to dawn upon them that consolidation is better than competition. Not that there will be no competition, but that an abundant supply of that article will come from an outside source—the gas company, which is rich, powerful, and determined to hold its own at any cost. I don't know that its attitude is at all unnatural, but I do know that, if the three electric light companies pooled their issues in some way, and worked in hearty accord, the gas company would find its hands very much more filled with business than they hitherto have been, and I feel equally positive that a little active employment of that sort would be particularly good for the gas company.

The fact is that a city like Boston, many of whose streets are narrow and tortuous, needs three or four times as many electric lights as it now has. To be sure, it would cost somewhat more than gas; but, if economy is the *sole* object, why not give up gas and use gasoline, which can be readily applied to street gas lamps? It would make the streets darker, of course, but it would be *cheaper*. Now, the fact is that cheapness in cost is not always a test of economy. I am satisfied that, were the streets of Boston lighted everywhere by good arc lamps, enough of the police force could be dismissed to far more than compensate for the increased cost over gas And I have reason to believe that the Police Commissioners of this city would confirm this view.

I have been taken to task, mildly, for what I said about the Thomson-Houston incandescent plant in the office of the American Electric and Illuminating Company on Congress Street. The trouble, I am told, is with the lamp used—the Thomson-Stanley. Not that the Thomson-Stanley lamp is not a good one—far be it from me to say anything to bring another combination down on my head—but that it is not adapted to be used in connection with the Thomson-Houston current. The fact seems to be, and I state it in order to satisfy everybody, that the current is all right and the lamp is all right, but that they were never made to be mated.

At last the exhibition is getting into shape, and the people are gradually beginning to find it out. Mr. Edison is coming over on Friday, and a whole lot of new stuff from his laboratory is to arrive before he gets here, and he will superintend the work of setting it up. Next week the "show" will be in proper shape for description, and I will try to send you over some notes of the new things.

The telegraph operators are combining here as elsewhere, not, as I understand it, with a view to any immediate action, but to be ready for an emergency, should one present itself. Let us hope there will be no more strikes. It is not true that they are *always* unjustifiable, but they generally are, and, as a rule, ought to be avoided. There is more than one employing company now; the number of individuals and firms who have an operator in their private service has increased, and there ought to be no trouble for *good* operators to get fair wages. The trouble with strikes is that they too often grow out of a demand that *poor* operators shall be paid equally well with good ones—a proposition with which no reasonable person can have patience for a moment.

Mr. Bowen's suggestion, contained in his letter which you printed last week, finds favor among the electric light men with whom I have talked here. From what I know of the fraternity, I believe that a call for such a convention, emanating from the right source, would bring together representatives from at least one hundred companies doing a lighting business, and running, in the aggregate, fifteen or twenty thousand arc lights. Certainly, the experience of so many men engaged in the same business in various parts of the country, and under varied conditions, would be "worth swapping."

ATLANTA, GA., Dec. 16, 1884.

Editors Electrical Review:

I have been asked several times why I did not keep up my old habit of writing an occasional letter to the REVIEW, and giving some of the news pertaining to our comrades of this profession from the South.

Times have been very dull in the South this summer and fall, and money extremely scarce. Especially is this the case in Atlanta, and merchants of many years' experience here say they never saw the fall trade so late opening as this season. New subscribers have been hard to secure, and many exchanges have done well to hold their own.

An exchange has been opened at Anniston, Ala., with Mr. S. B. Libby, of Orange, N. J., as manager. Mr. Libby had worked in Atlanta for the past six months, during which time he made many friends, and also, by a close application to his work, made quite a reputation as an expert telephonist.

C. C. Carlin, of Alexandria, Va., who for the past four months worked as an inspector in Atlanta, has been appointed manager of the exchange at Rome, Ga. Mr. D. H. Mullenix, formerly manager at Rome, Ga, has been appointed acting manager of the exchange at Macon, Ga., *vice* Mr. Davis, who has been removed. Mr. Mullenix will, no doubt, make a good showing in Macon, as that city is a violent rival of Atlanta, and keeps side by side with Montgomery, Ala., in her rapid strides to prosperity.

Macon, Ga., and Montgomery, Ala., are both flourishing cities, and claim many advantages over Atlanta, but, so far, Atlanta keeps decidedly in the lead, both as regards amount of business handled by the merchants and the number of telephones put up.

Mr. W. L. Woodruff, manager of the exchange at Birmingham, Ala., has just recovered from a serious illness, which confined him to his bed for two weeks. Mr. T. M. Bishop, an inspector from Atlanta, is helping out until Mr. Woodruff thoroughly recovers.

Considerable space might be filled with interesting reading about Atlanta Exchange, but I will not trespass on your space this time. Atlanta is the headquarters of W. J. Cole, superintendent Third District, Southern Bell Telephone and Telegraph Company, but, owing to the rapid growth and many changes in this district, Superintendent Cole has had to be on the road nearly all the time for the past seven or eight months. Many exchanges have been entirely rebuilt and one new one organized in his district during that time. Superintendent Cole also took a much-needed vacation during September, and visited his friends and relatives in the North; also attended the Electrical Exhibition at Philadelphia.

Mr. W. T. Gentry, formerly manager of the W. U. Telegraph office and Southern Bell Telephone Exchange at Alexandria, Va., has been manager of Atlanta Exchange since last April, and has made quite a good showing. During this time 213 new subscribers have been connected (which is fully one for each working day during his management), and nearly all the old stations re-run, and handsome walnut combination backboard and battery boxes put up in place of the old style. A new-style Law bell, with vibrating attachment, is now being rapidly substituted. The exchange has 550 subscribers connected, and will probably continue to increase at the rate of one per day.

A new multiple (Law system) switchboard, to accommodate 1,200 wires, has just arrived, and will soon be put in place.

Mr. H. H Jackson, assistant manager, does the collecting, and has had a serious time of it this summer, but it is hoped that this month will show an easier flow of money and an easier time for him, regardless of the rapidly-increasing list of subscribers.

C. H. Robinson, the efficient chief foreman of construction, is rapidly bringing Atlanta to the front as one of the finest-constructed exchanges in the world.

Should you desire more of this kind, I will give yon a description of the operating room and mode of inspection in my next.

TELEPHONE.

Within the next twelve months the corporate existence of eight hundred and seventy-four national banks will expire. They constitute in number one-third of the national banks now in existence, and their aggregate capital is $245,132,845, or nearly one-half of the whole national bank capital of the country. The reason of this is that most of them were originally State banks, which came into the national system all nearly together, in 1864 and 1865, and under the provisions of the National Bank Act are chartered for the term of twenty years, and no more.

—— Public electric lighting and electrical transmission are more than ever the questions of the day, and last week, at the suggestion of M. Cochery, the President of the Republic issued a decree creating a commission which will report on the best measures to adopt in fixing the conditions to be complied with in the interests of public safety, for the installation of conductors for the distribution of high currents. This commission, presided over by M. Cochery, consists of MM. Herve-Mangon, Jamin, Alphand, Delmas, Gariel Sartiaux, Mascart, Mille, Marquis de Braza, Jousselin, Guillaume, Bergon, Blavier, Georges Cochery, Cael and Raynaud. It held its first meeting on the 19th inst., and agreed upon the following programme for the work: To consider the precautions that should be taken when conductors are laid in the sewers or otherwise underground, above or along buildings, etc., and for their introduction and fixing within houses. 2. To prepare a list of conditions to be complied with on the part of contractors having charge of the installation of conductors intended for the transmission of power or light. 3. To ascertain the natures of wires, cables and methods of installation which should be preferably employed in such installations. 4. To determine the resistance offered by the wires, according to their sections, to the resistence of the current. 5. To fix the maximum current to be transmitted through conductors. 6. To recommend the best instruments for measuring the force of the current transmitted, and to determine a practical mode of control. 7. To suggest the necessary precautions to be taken by workmen when repairing conductors, so that they may not be exposed to danger. A sub commission, presided over by M. Jamin, perpetual secretary of the Academie des Sciences, will be intrusted with preparing the resolutions that will be submitted to the commission for discussion.

Telephonic News

*** The first telephone line ever constructed in Japan is now being built in Tokio

*** It appears that the subject of placing the different post-offices in Paris in telephonic communication with each other is under serious consideration.

*** Besides Furth and Nuremburg, in Bavaria, the city of Augsburg is to be furnished with a telephonic system. The subscribers will be furnished with a microphone transmitter, with two Bell receivers and a magneto electric call-bell.

*** The output of telephones by the New England Telephone Company in October shows a net loss of fifty-four, all except five of the instruments returned being those used at the summer resorts. The number in actual use November 1 was 17,737.

*** The process of infringement of patents has not ceased in England, and the United Telephone Company has given notice of its intention to seize two new telephonic apparatus—the valve telephone and the Boult apparatus—both of which, it appears, are covered by the patents of this company.

*** During the month of October 20,491 telegrams have been exchanged by telephone between the telephone subscribers and the telegraph offices of the new combination, in Belgium, as follows: 5,695 at Brussels, 3,656 at Liege, 3,202 at Antwerp 2,839 at Ghent, 2,287 at Charleroi, 1,250 at Verviers, 1,043 at Louvain, 539 at Mons.

*** A banquet was given by the members of the "Old Guard," at the Hotel Dam, on Saturday evening last, which was attended by twenty-five members and invited guests. The banquet and whole entertainment was considered one of finest affairs of the kind which have taken place this season. Several distinguished electricians were guests,

*** Last week the workmen under Superintendent Cole, of the Hudson River Telephone Company, stretched the longest wire in this section of the country. A line was run from Storm King Mountain to Breakneck Hill, for the purpose of connecting Newburgh with New York, and the distance covered was over 2,800 feet. The lowest sag of the wire is 203 feet above the high-water mark of the river, and the supports are fully 1,000 feet above it.

*** When two men with gruff, heavy voices try to converse with each other by telephone, the effect is very amusing to listeners at their end of the line. A meeting by wire was arranged the other day between two men who have voices that acoustically are a compromise between a saw-mill and a quartz crusher. They are also possessed of tempers that materialize at the slightest provocation. They were not aware, of course, that their interview was "fixed," or that a wicked scribe sat near at hand to capture what was said. After the diaphragms in both telephones had been shattered, and the heated vocalists had started out to hunt for each other, the scribes met and "dove-tailed" their notes, and the following resulted: "Hello!" "Hello!" "Is that Mr. B——?" "Don't speak so loud; I can't understand a word you say." "If you are going to bellow in that way, go outside where you can paw sand; but send some one to telephone first who can talk." "My dear sir, you seem to think this telephone is a hundred-acre lot! don't blat so, man." [Louder.] "Say, you confounded idiot! you can't send a cyclone through this thing and be understood. Stand back a couple of blocks and talk; maybe I can catch a word or two now and then, if you do." "Oh! come off. Do you suppose I can understand the noise a lot of cattle make around a fresh hide? I ain't an open-air meeting. Go out somewhere and roar at a mark." "Oh, you go to h——!" "You're a fool," and they hung up the microphones with a bang and started out.

*** It is understood that the Canadian Minister of Agriculture does not consider the evidence adduced against the Bell Telephone Company, at the recent contestation, as sufficient to justify him in annulling that company's patent.

*** Mr. I. H. Farnham, superintendent of the Portland Telephone Exchange, has been called to Boston as electrician of the New England Telephone Company. The engagement is for the winter, and may become permanent. Mr. Farnham has been connected with the Portland Exchange since September 1, 1879. Mr. A. L. King, assistant superintendent of the Lewiston division, will succeed Mr. Farnham as superintendent of the Portland division. During Mr. Farnham's connection with the telephone system of Portland he has sold three patents to the company—two on central office switch and one on individual bell. Under Mr. Farnham's management, the Portland Exchange has been placed among the best in existence.

*** General Manager Uline, of the Hudson River Telephone Company, replying to a reporter on Thursday said, "The suit of Drawbaugh, Baxter, Reiss and others against the Bell Telephone Company, was one of the greatest which has ever come into the courts. The Bell Telephone Company has won sixteen suits for infringements on its rights before this, and the last victory capped the climax. Judge Wallace declared in favor of the Bell patents, and his decision restrains all other companies from putting up or using lines or instruments infringing on the Bell Company's rights."

"How is your company affected by the decision ?"

"It is of vital importance to us. We have a plant worth fully $2,000,000, covering the entire territory and all exchanges from New York to the Canada line, including everything east of the river and for about fifty miles west of it. The decision prevents any opposition and gives us absolute control over our territory."

"Did you have any fears about the results of this last suit ?"

"None at all. I was positive the Bell Company had the best of it from the beginning. Why, about a year ago, when parties came here to start a rival company, I advised my friends to keep out of it or they would lose every dollar invested. Now they are rather glad they did as I advised."

"Does this suit settle all the claims ?"

"Yes. The claimants pooled their interests with the Drawbaugh Company in a final effort, and are beaten."

"How about an appeal ?"

"I don't think they will do anything of the kind. They may say so, as all beaten parties are liable to do under the sting of defeat, but they wont do it. They have spent enough money already and will be only too glad to stop where they are. I can see no possible grounds for an appeal."

"When did these suits begin ?"

"I think it was about the fall of 1880. The rival companies took possession of the entire country and claimed that the Bell patents were void. When they began putting up lines the Bell Company brought suits to restrain them, and this decision of Judge Wallace in favor of Bell is the end of the contest."

"How did Bell's rivals get so deep in the mire ?"

"I think it was because a Philadelphia judge declined to grant a temporary injunction restraining them, on the ground that it might prejudice the suit already begun. This encouraged them, and finally a big capital was represented in the case."

"Have you any idea how much capital the opposition represented ?"

"Yes. Drawbaugh's pretensions, acquired for nothing, immediately expanded into a capital of about $5,000,000. Then they tried to sell stock to raise money, and offered it at about fifteen dollars per hundred, half cash and the other half after the suit was decided in their favor. They probably got the idea from the scheme of issuing Confederate bonds."

"How about stockholders under the defeated patents ?"

"They can't do otherwise than lose their investment, and it looks some as if they would have to pay further assessments to cover the expenses."

"How did Bell stock show the effect of the decision ?"

"The stock went up gradually during the last stages of the suit, from 150 to 190. When the decision was given it jumped to 280. The Boston papers quoted it, on Friday, at 265½, ex-dividends, including the regular quarterly dividend of three per cent., and also an extra dividend of three per cent., making fifteen per cent. for the year."

"The decision will be likely to cause a rush of business for the Bell Company, will it not ?"

"I should say so. Take our company as an instance. While the suit was pending we were cautious about extending lines, and did not nearly meet the demands for our instruments. Now we will go to work. I shall negotiate during the winter for poles, and next season we will extend our lines more than we have done in the whole four years in which the suit has been pending. We expect a rapid increase in orders for telephones, and already we notice the difference in our business. Many people hesitated to order instruments while the suit was pending. They thought that if the Bell Company was beaten there would be no royalty to pay and rates would be reduced. Now their orders will come in with a rush."

"How many people subscribe for for telephone in Albany ?"

"Over 1,200 in the incorporate limits of the city. We have altogether in our territory now about 5,000 instruments."

"And this decision gives you a monopoly of the entire thing ?"

"Without any doubt. But it does not affect royalties and will not affect our rates as established during the past two years. We have fixed our rates from time to time according to the actual expenses of construction and maintenance of our lines and instruments."

"Is this expense heavy ?"

"You can judge of that when I say that it costs us about $260 per month to keep in repair the instruments in this city alone. We make no additional charge for improvements and are as desirous of giving a good service as our customers are to have it."

"Then you have some difficulties ?"

"Yes, but we can easily overcome any defects in lines or instruments. The greatest trouble we have is with people who have no right to the telephone, but persist in using the instruments of their friends. Owing to the construction of the switch boards only a certain number can operate them. Unless we cut off those having no right to use the telephones, those who pay for our service are delayed and annoyed. If those who don't subscribe for the telephone would recognize the fact that they have no more right to take our service than they have to walk into a store and appropriate another man's goods, we could give our patrons entire satisfaction. We have a large force, capable of answering all calls, and could give a perfect service but for this annoyance.

"Of course you give employment to a large number of persons."

"Yes, we have upwards of 600 employes now in our territory, and over 100 of these are in this city. They get good wages, averaging from $25 to $150 per month, and as our lines extend the force will be increased."

"Have there been any recent improvements in the telephone ?"

"Nothing of interest to your readers. The Bell Company have experts constantly at work perfecting their 225 patents and the result is a steady improvement in the working of the instruments. The trouble from induced currents on long lines is being overcome and this will remove one great difficulty. We find our aerial cables work all right, and shall put up more of them and so remove the objection to so many wires crossing the streets."

"I am well satisfied that the telephone has a great future in store for it," continued Mr. Uline, "and believe our lines will connect all large towns in the near future. In the past six months, wires have been run from Boston to New York, and work perfectly. Philadelphia, too, will soon be connected with the metropolis, and an independent company has been organized, under the Bell license, to build the line. The decision in our favor removes all doubts from the minds of investors, and capitalists will now hasten to put their money into so profitable an investment."

What is above stated by General-Manager Uline is true, we should say, generally speaking, for the whole territory.

Telephone Transmitters.

It is doubtful if the following embodies anything at all original. But it occurs to me that while so many are working at "magnifying," "amplifying," or some other back-action form of battery transmitter, it would be a good idea for some ingenious inventor to get up a magneto-transmitter.

We all know that the Bell telephone is a transmitter as well as receiver. Most telephone men also understand that the telephone is a magneto machine, and that the movements or vibrations of the armature (diaphragm) induce, or produce, currents of electricity in its coil, the same as does the rotation of the armature and coil of a magneto bell; but it would be a poor bell that used straight bar magnets and simply revolved its armature in front of them. The magnetism or force of magnets is manifested at their ends, and in the magneto bell we find them bent into a horseshoe shape, and the armature and coil placed between the poles, where the force is greatest.

Now, if the bell and telephone are practically the same, and work upon the same principle, why not apply the same arrangement that gives such good results in the bell, at near as possible to the telephone ? If we can increase the amplitude of the vibrations and the force of the magnetic field, why can we not increase the strength of the current produced, and therefore the effect upon the receiver? It certainly seems feasible.

If the telephone works by, and from, the slight vibrations of an armature in a weak magnetic field, certainly greater and stronger results should be obtained by a larger movement in a stronger field. Of course, we must have a diaphragm that can be moved easily by the power of the voice, and that will respond freely and quickly to the slightest sounds. But the small diaphragms of the Blake and Bell are a long way within the limit. We can use larger than either of these with safety.

At any rate there is lots of room and much to be gained by some improvement of this sort in transmitters.

All thoughtful telephone men can appreciate the great advantages that would be derived from a practical magneto-transmitter. One that would talk as well as the battery microphones, under all conditions, would be worth a big fortune to its lucky inventor, and an untold boon to the telephone fraternity, doing away (as it would), with the battery, its local circuit, and their train of attendant troubles.

At a rough estimate, half the instrument troubles of any exchange are found in the battery and its circuit, or the switch; and if by any means we can do away with these, we will have made a long stride on the road to "perfect telephone service." A. F. A.

.... The statistics of the Telegraphic Department of Denmark for the year 1883 fixes the total length of the lines at 504 leagues (about 1,512 miles). Four new offices were opened during the year, which brings the total number up to 152, besides which 165 railway telegraph offices have been opened to the public. Including the offices in the maritime fortifications, there were, at the end of the year 1883, a total number of 323 telegraph offices opened for public use. The number of public telegrams sent was 1,247,281, against 1,192,120 for the preceding year. The total number of both public and official telegrams was 3,561,111, and the receipts were 685.583 kroner (about $191,365), against 664,181 kroner for the preceding year.—*La Lumiere Electrique.*

Canadian Government Telegraph Lines.

Though the Government seems in no hurry to undertake the construction of a national system of telegraphy, the fact should not be lost sight of that the expenses it has incurred in construction and maintenance outside of the centers of population have already been quite considerable. We append a statement of this branch of the public works, and, as it is taken from official sources, it may be thoroughly relied on. To give it completeness, we supplement it with a table of the rates charged.

It has been generally known for some time by persons who cared enough about it to inform themselves that the receivers for the Bankers and Merchants'—Richard S. Newcombe and J. G. Smith—have been dissatisfied with the proportion of the receipts turned over to the Postal Telegraph Company, believing that the last-named company was getting too much money for the amount of their business.

The receipts of the Bankers and Merchants' Company have not been sufficient to enable the receivers to meet the interest due on the large bonded debt. While the employes have waited months for their pay, business has been falling off until the hopelessness of struggling to maintain the united lines was apparent. It was generally rumored around town last night that the Western Union Company had secured control of the Bankers and Merchants' Company, and would take charge of their offices and lines after midnight. President Norvin Green says that the report is untrue. "Such an arrangement has not even been discussed," he said. "It would be simply absurd to think of it. If the Western Union Company bought up the lines of either of those companies, it would have to assume the entire bonded indebtedness of the lines purchased, which would be about three times as much as the property is worth. The Western Union Company is not so foolish as that."

At the offices of the Western Union and the Bankers and Merchants' Companies at midnight both companies were doing business under the usual regulations, with no orders suggestive of any change of management.

A gentleman who is in a position to know what is going on in telegraphic circles said: "Messages have been sent to Chicago advising the officials there that the Postal Telegraph and Cable Company had separated from the Bankers and Merchants', and directing Western Union men to take possession of the offices and wires, including those in the sugar district, Grand Pacific Hotel, and open and regular Boards of Trade. Upon what terms the deal has been effected I cannot tell just now."

TARIFFS ON DOMINION GOVERNMENT TELEGRAPH LINES.

LOCATION OF LINES.	Extreme Distance in Miles. Land Lines.	Cable.	Total.	Rate for a message of 10 words; and for each extra word. The address and signature not charged for.
NOVA SCOTIA—				
Between North Sydney and Meat Cove, Cape North	126	½	126½	25c. and 2c.
Between Barrington and Cape Sable Island Light	17½	1½	19	12c. and 1c.
NEW BRUNSWICK—				
Between offices on Grand Manan	21			15c. and 1c.
Between offices on Grand Manan and Campobello	8	7¼		25c. and 2c.
Between offices on Grand Manan and Campobello and East Port		1⅞	38⅛	25c. and 2c.
Between Chatham and Escouminal	43		43	15c. and 1c.
QUEBEC—				
Between offices on Magdalen Islands	83⅜			25c. and 2c.
Between offices on Magdalen Islands and North Sydney	126½	73⅜	283¼	75c. and 5c.
Between offices on Anticosti Island	214			25c. and 2c.
Between offices on Anticosti Island and Gaspe	28	44¼	286¼	75c. and 5c.
Between offices on North Shore office east of Bersimir	75	38	113	25c. and 1c.
Between offices on North Shore east and west of Bersimir				40c. and 2c.
Between offices on Orleans Island	about 31			15c. and 1c.
Between offices on Orleans Island and Quebec.	13	¾		15c. and 1c.
Between offices on Orleans Island and Grosse Isle	1	5¼		25c. and 1c.
Between offices on Grosse Isle and Quebec			54	25c. and 1c.
NORTH-WEST TERRITORY—				
Between Qu'Appelle and Edmonton	537		537	75c. and 5c.
Between intermediate offices, 25c. and 2c. to 75c. and 5c., according to distance. *Example.*—Qu'Appelle to Fort Qu'Appelle, 17 miles, 25c. per 10 words, and 2c. for each additional word. Qu'Appelle to Battleford, 281 miles, 50c. for 10 words, and 3c. for each additional word.				
BRITISH COLUMBIA—				
Between Victoria and Barkesville	653	23½	676½	$1 and 5c.
Between intermediate offices, 15c. and 1c. to $1 and 5c, according to distance, as explained in example given above.				

A careful study of the above shows the important and interesting fact—one scarcely known outside of departmental circles—that in proportion to population Canada enjoys greater telegraphic accommodation than any other country in the world, there being within the Dominion one station to every 1,914 persons, as contrasted with one to every 3,700 persons in the United States, and one to every 6,508 persons in Great Britain. The value of such means of communication, even in distant places where the population is at present sparse, makes the emigrant feel not far from home no matter where he may be settled in the Dominion, and at the same time enables him to dispose of his crops, etc., to the best possible advantage.—*The Shareholder.*

.... The pooling arrangement under which the Bankers and Merchants' and the Postal Telegraph companies have been doing business since the retirement of the Baltimore and Ohio Telegraph Company from the celebrated tripartite agreement, was dissolved last week by mutual consent, as well as by necessity. The Bankers and Merchants', although in a receiver's hands, has been in great financial distress. It is stated that a complete separation of business interests at stations where the offices of two companies have been mutually conducted will be arranged within a few days.

.... The cable which was laid by the Wurtemburg Administration of Telegraphs, in 1865, between Kreesbran and Haardt, near Bregenz, and which had worked uninterruptedly for nineteen years, is now interrupted; while another cable laid in 1854, between Fredericksbaven and Romanhorn, is still in good order. The faulty cable has been raised out of the water, disclosing a complete rupture, the wires of the armor, as well as the conductors, being gnawed asunder. The cable was renewed throughout a length of 600 meters (about 1,800 feet), and now works as well as before.

... The Baltimore and Ohio Telegraph Company have completed a contract for the construction of several thousand miles of line through northern New England, and work will begin early in the coming spring. Two trunk lines will be built—one from Boston to St. John, N. B., passing probably through the section now traversed by the Boston and Maine Railroad, as far as Portland, and covering the cities of Lawrence, Haverhill, Dover and others, with branch lines to Newburyport and the towns nearer the coast; the second trunk line extending from Boston to Montreal. Telegraph and telephone will both be used on these lines. The New England division will be known as the Atlantic. In Boston the northern lines will connect with the New York wire.

.... The quarterly report of the Western Union Telegraph Company, for the quarter ending September 30, 1884, shows the following items: Surplus July 1, 1884, $4,157,468.89; net revenues, $1,545,529.17. Deducting the following appropriations: Dividend of 1¾ per cent. paid October 15, $1,399,807.49; interest on bonded debt, $124,000; sinking funds, $20,000; a surplus was left on October 1 of $4,159,190.57. The net revenues of the quarter ending December 31, based upon nearly completed returns for October, partial returns for November, and estimating the business for December, will be about $1,500,000, to which the surplus on October 1 is to be added, making $5,650,190,57. Deducting from this amount the interest on bonded debt, $124,000, and sinking funds, $20,000, leaves a balance of $5,515,190,57. It requires for a dividend of 1½ per cent. on capital stock $1,199,837, and deducting this from the balance leaves a surplus of $4,315,353.57. A dividend of 1½ per cent., payable on December 20, has been declared.

.... The *Times*, of Thursday last, commenting on the report that the Bell Telephone Company proposed to endeavor to double its capital stock in order to develop the possibilities of long-distance telephoning, asks: "What has become of Article 13 of the contract between the Bell Company and the Western Union Telegraph Company, signed November 10, 1879, which provided that connecting telephone lines should not be used for the transmission of general business, messages, market quotations, or news for sale or publication in competition with the business of the Western Union Telegraph Company, and that the Bell Company should not license the use of its telephones or patents for the transmission of such matter?'" When I called the attention of Dr. Norvin Green to this paragraph, he said: "Yes, I think the quotation from the contract is correct, but I don't see how they got it. The kernel of the matter is right here: The contract expressly defines what sort of use the Bell Company can make of telephoned news which cannot be taken for a third party. It must be sent to the person at the receiver. This is the distinction which the contract makes between telegraphing and telephoning. We hold the right to the use of the telephone for telegraphing purposes—that is, where a message is taken down to be sent to some one other than the man that receives it. We do not fear that long-distance telephoning will interfere with the telegraph business, for there are not enough minutes in the day. The Bell Company has been experimenting between here and Philadelphia, and proposes to charge twenty-five cents for five minutes at the receiver. But, when delays are taken into account, not enough quarters will be picked up to make it pay, I think, especially as a dispatch can be telegraphed for fifteen cents."

TELEGRAPHIC

.... The courts have authorized the Bankers and Merchants' Telegraph Company to issue $130,000 receivers' certificates.

.... The Director-General of Telegraphs in British India is now in Berlin studying the workings of telegraphic institutions in Germany.

.... The receipts of the British Department of Telegraphs from April 1 to Oct. 28, 1884, were $5,400,000—an increase of $25,000 over the corresponding period of last year.

.... It is said that Senator Mahone, of Virginia, has brought suit against the Southern Telegraph Company in a business complication involving the sum of $2,500,000.

.... The telegraph steamer, the Mackay-Bennett, constructed by Messrs. Elder & Co. for repairing the cables of the Commercial Cable Company, was launched on Friday, November 21st.

.... The number of dispatches transmitted by the Cuba Submarine Telegraph Company during the month of October was 2,588, which produced a revenue of $11,000, against 2,814 for the same month of last year, with a revenue of $13,720.

.... The question of a government postal telegraph once more agitates the land. Underneath the whole thing lies the old, old question of centralization. Will better telegraphic service counterbalance the necessary evils inherent in an extension of Federal powers?

.... A telegraph line, 700 miles long, is now in course of construction in Australia, between Northampton and Rolburn, for the purpose of establishing rapid communication with the latter colony, in the hope that an English company will lay a cable between Java and North-West Cape. The first and most difficult part of this line, between Northampton and Hamlyn Pool, a distance of 140 miles, has been finished. The poles are of iron, and made in two sections.

.... Herr Justin Malisz, chief of the telegraph department on the Galician railway, remedies the induction from telegraph wires passing through walls, due to the condensation of vapor in the ordinary porcelain tubes, in the following manner: He forms the insulating covering of three porcelain tubes, slightly inclined outward, surrounded by cement and joined with Jew's pitch dissolved in pure turpentine, the last tube terminating in a bell on which the water of condensation drips both inside and outside.

.... The French Minister of Posts and Telegraphs hopes to inaugurate, on the 15th of December, the completion of the pneumatic tube system of Paris, thus extending the service of telegram cards and enveloped telegrams to all of that portion of the city comprised between the Rue Lecourbe; the line of the exterior boulevards, from the Rue Lecourbe to the Seine, and the fortifications from the National Bridge to the Rue Lecourbe. All of the quarters of the city are now connected by pneumatic tubes, and the complete system will be in actual operation on January 1st, 1885.

.... We give below some additional and later details about the cable which traverses the Arlberg Tunnel, recently referred to in these columns, when we announced the opening of the line for traffic. It is composed of twelve conductors, six of which are reserved for the service of the State, three for railway business, and three for spares. Each conductor is formed of seven fine copper wires, twisted and embedded in gutta-percha. The envelope is of tarred hemp, covered with eighteen galvanized iron wires, around which is enrolled a band of tarred cotton. At the two extremities, and outside of the tunnel, are attached lightning-arresters connected with a very extensive ground wire, to protect the cable against any violent discharge of atmospheric electricity.—*La Lumiere Electrique.*

ELECTRICAL AND SCIENTIFIC

* * Parties who do not believe in a continuance of the present low price of copper state that the owners of the Butte Mines, in Montana, which have been so widely advertised as exporting matte and black copper to Swansea, Wales, at a profit, are quietly endeavoring to form a syndicate of capitalists in Europe to buy the property.

* * Rubber, or gutta-percha, may be united firmly to metal by the following method: Dissolve finely powdered shellac in ten times its weight of pure spirits of ammonia. In three days the cement will have the necessary consistency. The ammonia penetrates the rubber, and enables the shellac to take a firm hold. When all the ammonia is evaporated, the joint withstands the penetration of gas or water.

* * A wire rope has just been manufactured in the works of Sir Geo. Elliott, M. P., at Cardiff, for the North British Railway, which is two thousand three hundred fathoms in length, or two miles and a hundred and eight yards. It weighs twenty-one and a half tons. Nearly a hundred thousand fathoms of wire have been used in making it. This huge rope is to be used in working the trains in the tunnel at Glasgow, between Queen Street Station and Cowlairs

* * Electric bells have been placed in every committee room in the Senate wing of the Capitol at Washington. Heretofore, when Senators were to be summoned from committee rooms to answer a roll-call, pages had to be sent to the various rooms, much inconvenience and delay resulting. Now a touch upon a button in the Senate Chamber will notify Senators in their committee rooms that a vote is to be taken, or that for some other reason their presence is required in the chamber.

* * In the lead production of different countries Spain still holds first rank, the amount reaching some 120,000 tons in one year, or one-sixth more than America, which comes next on the list, while Germany follows with 90,000. Of Spain's total production, some 67,000 tons are derived from one district, that of Linares, in which more than 800 mines are registered. The total number of steam engines employed is stated to be 130, nearly one half of this number belonging to English companies; in fact, most of the mining machinery and pumping engines in all the mines are of English make

* * The latest system for preventing collisions on railroads is the Sirieix' electrical system of San Francisco. The electricity is generated by a dynamo on the locomotive, and the connection is made to the wires running inside the rail along the ties with projecting points every forty feet by means of a plate swinging beneath the engine and tender. Wires are led to a bell and whistle on the locomotive. The current sent through the plate, and thence through the wires beneath the track, on coming in contact with the plate of an approaching engine, forms a circuit, and the bells in both cabs are rung. For trains running in the same direction, the same wire is used, trains traveling in opposite directions having separate wires.

* * A writer in an English technical journal, having explained how cold air is the cause of smoke, which may be greatly reduced by care, remarks that in the open fire grate the existing fire ought to be drawn to the front of the grate, allowing the fresh coal to be placed behind or on the back of the fire; thus, the fire in the front will burn more rapidly, warm the air above, and so prepare the rising gases for combustion In this way the amount of smoke is diminished, as the gases from the coals at the back rise much more slowly than when placed upon the fire and the air partly warmed. For stoves and boilers, warm air may be produced for the entire combustion of all the gases, a result which is beneficial in various ways.

List of Officers and Directors of the Western Union Telegraph Company.

NORVIN GREEN, President.
THOMAS T. ECKERT, Vice-President and General Manager.
HARRISON DURKEE, JOHN VAN HORNE, GEORGE J. GOULD, } Vice-Presidents.
J. B. VAN EVERY, Acting Vice-President and Auditor.
A. R BREWER, Secretary.
R. H ROCHESTER, Treasurer.
CLARENCE CARY, Attorney.

Board of Directors.

Norvin Green,	Robert Lenox Kennedy,
Thomas T. Eckert,	Hugh J. Jewitt,
John T. Terry,	J. Pierpont Morgan,
John Van Horne,	Frederick L. Ames,
Harrison Durkee,	John Hay,
Jay Gould,	William D. Bishop,
Russell Sage,	C. P. Huntington,
Alonzo B. Cornell,	George B. Roberts,
Sidney Dillon,	Frank Work,
Cyrus W. Field,	Erastus Wiman,
George J. Gould,	John J. Astor.
Samuel Sloan,	Chauncey M. Depew,
John Pender, M. P.,	James W. Clendenin,
Henry Weaver,	Abraham Van Nest,
Percy R. Pyne,	George D. Morgan.

Executive Committee.

Norvin Green,	Russell Sage,
Thomas T. Eckert,	Alonzo B. Cornell.
John T. Terry,	Sidney Dillon,
John Van Horne,	Cyrus W. Field,
Harrison Durkee,	George J. Gould,
Jay Gould,	Samuel Sloan.

Eastern Division General Superintendent.
Charles A. Tinker.....New York.

Eastern Division District Superintendents.
1 W. C. Humstone, New York.
2 R T. Clinch, St. John, N. B.
3, 4 Thomas Roche, Boston, Mass.
5 S. B. Gifford, Syracuse, N. Y.
6 W. B. Gill, Philadelphia, Pa.
7 W. J. Holmes, New York.
8 Chas. O. Rowe, Titusville, Pa.

Central Division General Superintendent.
R C. Clowry.....Chicago, Ill.

Central Division District Superintendents.
1 F. H. Tubbs, Chicago, Ill.
2 L. C. Baker, St Louis, Mo.
3 J. J. Dickey, Omaha, Neb.
4 Frank Jaynes, San Francisco.
5 E. P. Wright, Cleveland, Ohio.
6 John F Wallick, Indianapolis, Ind.
7 I. N. Miller, Cincinnati, Ohio.
8 I. McMichael, Minneapolis, Minn.

Southern Division General Superintendent.
James Merrihew.....New York.

Southern Division District Superintendents.
1 J. B. Tree, Richmond, Va.
2 James Compton, Nashville, Tenn.
3 J. A. Brenner, Augusta, Ga.
4 C. G. Merriwether, Mobile, Ala.

William Holmes, Supt. of Tariff and Check Bureau, New York.
D. Doren, General Supt. of Construction, New York.

Supply Department.
William Hunter, Supt. and General Purchasing Agent, New York.
E. C. Cockey, Storekeeper, New York.
James S. Dickinson, Storekeeper, Chicago.

.... Western Australia is engaged in constructing a line of telegraph along about 700 miles of its coast line, from Northampton to Roebourne, the object being two-fold, viz: First, to establish speedy means of communication with the settlements near Roebourne; and secondly to induce an English Company to run a cable to North-West Cape from Java. The first and most difficult section, from Northampton to Hamlyn Pool, a distance of 140 miles, has just been completed: of this, for 115 miles, the line runs over heavy sand plains and hills, and as, unfortunately, it had to be constructed in the summer, it has proved a trying task for man and beast. Mr. Carey has been entrusted by the Government with the charge of this most important work. His staff consists of Mr. Parish (overseer), and a light survey party, with which he keeps in advance, pegging out the route for the line, himself returning from time to time to inspect the line, while Mr. Parish, the Government overseer, is closely watching on behalf of the Government to see that the specifications are carried out. The transport consists of 20 horses, 2 wagons and wagonette, and 30 camels, recently purchased in South Australia at the suggestion of Mr. Kean. With the camels there are five Afghan drivers thoroughly broken into this work. A ketch of about 70 tons follows the party along the coast, laying poles, stores and water at all available landing-places. The working party consists of white men and Chinamen, 15 in all. The poles used on this line are iron; they are in two sections; the short section is 4 feet 6 inches long, and is supposed to be driven into the ground where practicable, or, if the ground is too hard, inserted in a hole bored by an auger. The use of the auger was found to be a slow and tedious process and was abandoned for the spade, in both hard and soft ground. The socket once in, the long section is lifted up and dropped into the socket, cement being then poured in to bind them together.—*Engineering.*

The Burton Electric Heater.

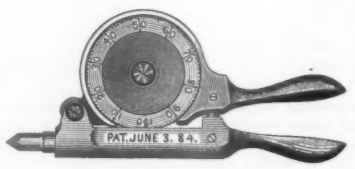
This Electric Heater, invented by W. Leigh Burton, Richmond, Va., is based on the well-known fact that electricity, in passing through a conductor of insufficient capacity, such, for instance, as a wire of small diameter, evolves or develops heat.

It is claimed that a wire of any great length and small diameter will not conduct a strong current of electricity without difficulty and loss; for as the wire becomes heated its resistance is increased, and in consequence the heat becomes so great that the wire will be fused.

The object of this invention is to obviate this difficulty, by enabling a strong current of electricity to pass through a heat evolving apparatus of any length: and to this end, it consists of an electrical conducting chain or coil, with intervals of small conducting power, in traversing which the electricity will be caused to develop heat; and further, in interposing between said obstructing-intervals free conductors of much larger size, which constitute absorbents and radiators of heat. The heater exhibited, therefore, consists of an alternate arrangement of obstructing media and free conductors or radiators, arranged in a compact form, and insulated, within a suitable fire-proof casing, covered by a metal plate. In this heater the obstructing media consists of platinum wire No. 2, English standard, and the free conductors of copper blocks, 1¾ inches in length and ½ in square. The aggregate length of the obstructing media is about 7 inches, and the weight of the 57 blocks of copper about 8 pounds. The entire length of chain or coil is about 10 feet It rests on a metallic bed insulated with mica, and is reflexed in lengths of a foot, the insulation between the reflexions being accomplished with strips of mica ½ inch wide. This is contained within an iron box, 18x12 inches, the spaces between the apparatus and sides of the box being filled with a mixture of plaster and asbestos. Connection is made with an electrical current by means of the two ends of the coil passing through glass insulators, terminating in binding screws on the outside of the case.

Pratt's High Speed Indicator.

In this Speed Indicator the toothed dial is carried by an arm hinged to the main frame, and within the frame is journaled a loosely-turning worm-spindle. The main frame and arm are provided with hand grasps. When in operation the spindle is turned loosely in its bearings by the shaft. The operator by means of the handle of the pivoted arm can instantly gear the indicating dial with the worm shaft at the very beginning of the

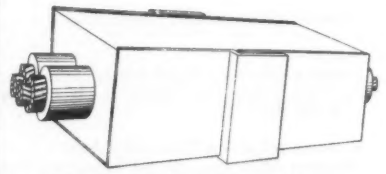


period of time for which the velocity is to be determined. At the end of each period the dial is as quickly disengaged—the recoil of a spring, when the handle is released, forcing the pivoted arm at once from the spindle. A set screw governs the approach of the dial-teeth to the worm and prevents the dial-teeth from being forced or crowded in upon the spindle with so much friction as to abrade or wear off their faces. The instrument is finished in first-class style, and will be sent in a neat leather pocket case on receipt of price. The above cut is one-third the actual size.

New Incandescent Lighting in Antwerp.

Contracts have just been signed for what is practically the first large house to house installation of the incandescent electric light in Europe. There are, it is true, two small public lighting stations in London, one in Colchester, and one in Berlin, but the plant now being erected in Antwerp is really the first of any magnitude. The installation is undertaken by the Cie. General d'Electricite of Brussels, who are using the Gulcher dynamo and the Notomb lamp. The district to be lit up is the new quartier, or near the Station de L'Est, and includes theatres, several cafes, and a large number of private houses. The Cie. General d'Electricite are to supply the lights to the different consumers at so much an hour per light, or its equivalent, undertaking the risk of breakages of lamps themselves. There is to be one central station at the corner of the Rue Cohink and Rue Lois, and branches are taken from the mains into the houses. The whole of the mains and wires are to be laid upon the Callender system by the Callender Company of London, Brussels and New York.

This, we believe, is the largest piece of underground electric lighting work done in Europe or elsewhere, nearly 70 miles of heavy copper wire being used in the mains. The main cables from the engine house are laid as below, five cables being put in one trough.



SECTION OF CALLENDER CABLE.

These cables are the largest electric light cables ever manufactured. The conductor is composed of a strand of nine teen No. 6 wires, and they are insulated with "bitite," protected by braiding, and laid in an iron trough and surrounded with bitumen, as shown in the sketch; experience in Europe showing this to be the most permanent and economical way of laying underground wires. The work is to be all completed and in operation by the first of February, 1885.

The Davis Positive Action Cut-Out and Contact Changer.

The Electrical Development and Manufacturing Company, of Boston, Mass., has acquired the sole right to manufacture and sell the Davis cut-out and contact changer, recently invented, and is now prepared to fill orders from electric lighting companies and others requiring a simple, absolutely safe and effective cut-out, circuit changer or pole changer.

In using this cut-out for electric light circuits, it is impossible to form a dangerous arc, even under the severest tests, for the reason that the contact points are not moved until the switch handle has brought them under the control of powerful springs, and out of control of the operator. This being the case, when the handle is moved in either direction, the possibility of leaving the contact pieces in a dangerous position, or of drawing an arc by a slow movement of the parts, is avoided.

The most important feature of this switch is the embodiment of the principle above explained, but in all other respects the parts have been so arranged and constructed as to avoid all objections hitherto discovered during an extended experience with various other forms by the inventor. The contacts are all double and removed to a safe distance from any inflammable material, the contact points are well separated by air spaces, and the general construction substantial in every respect.

Constructed as a circuit changer for switching lamps from day to night circuit, the rapidity of movement, and its position as well as automatic character, renders the manipulation of the switch perfectly safe in the hands of an inexperienced person.

As a pole changer, the rapid automatic

movement is obviously of especial advantage.

Following is a description of the construction and operation of the Davis cut-out, reference being had to the diagrams. Each cut-out is properly inclosed in a neat box, with sliding cover, not shown:

Fig. 1 represents the position of switch, with lamps cut out of circuit; the dynamo terminals *D* and *D'* being connected by contact piece *B*, and the loop terminals *E* and *E'* being out of contact with the dynamo circuit.

Contact pieces *B* and *B'* are mounted on the hard rubber block *A*, which block is loosely pivoted upon shaft *A'* and may be thrown powerfully in either direction by compression springs *G G*.

The moving ends of compression springs *G G* are attached to oscillating plate *O*, which is a part of the shaft *A'*.

Oscillating plate *O* carries two pins *N N*, arranged in the path of lever *L*, also loosely pivoted on shaft *A'*, and lies between the pins *N N*.

In switching the loop of lamps into the dynamo circuit—that is, from the position shown in Fig. 1 to that shown in Fig. 2—the operation is as follows:

If the lever *L* be moved in the direction of its reversed position, it will bear against one of the pins *N N*, and move the oscillating plate *O*, so as to compress the springs *G G*, bringing them to a position of equilibrium.

Thus far, however, the block *A*, carrying the contact pieces, has not been moved. If, now, the lever *L* be carried a little farther, the springs *G G* will pass beyond their equilibrium, and throw the plate *O*, the pin *N* being thereby brought forcibly against block *A*, carrying it, with the attached contact pieces, into the position shown in Fig. 2, breaking the dynamo circuit by separating the contact pieces *B* and *D'*, previous to which, however, the loop terminals *E* and *E'* are electrically connected with dynamo terminals *D* and *D'*.

To again cut off the lamps, a movement of the lever *L* in the opposite direction will bring the springs to a position of equilibrium before moving the contact pieces, and reverse the operation above described.

It will be understood that the lost motion between the lever *L* and pins *N N* prevents any to-and-fro movement of the contact pieces by manipulating the lever, and the lost motion between the oscillating plate *O* and block *A* prevents a change of contacts until the springs have absolute control.

—— In the discussion of the paper on "Domestic Electric Lighting," read by Mr. W. H. Preece at the recent meeting of the British Association in Montreal, Sir W. Thomson referred to the facilities afforded by the proximity of the Lachine Rapids, situated five miles distant, for lighting the city by electricity, generated by the aid of natural forces. An experiment in this direction is now being made at Bellegarde, in the Department of the Saone-et-Loire. Some two and a half years ago, M. Dumont, a manufacturer of the town, was granted permission to utilize the waters of the Valserine (a stream in the vicinity), with the view of obtaining a supply of motive power, and the necessary works were commenced. They were finished last year, and are described in *La Nature*. The course of the stream lies between high rocks, and the water is dammed up by means of a wall about 40 feet wide at its base, and having three sluices for regulating the direction and volume of the current. The water has a fall of 165 feet, and flows out at the rate of 1,100 gallons per second, being equivalent to a hydraulic power of 2,000 horses. This force it is intended eventually to divide between three turbines, one of which (of 600 horse-power) has already been fitted up, and is employed in driving the machinery used in the lighting of the town by electricity. The current is generated by two small Gramme machines, and the lighting is done by Edison incandescent lamps placed in the ordinary street lanterns. No accumulators are employed, so that the current passes to the main conductor (which is carried round the town on poles) directly from the generators; its strength being regulated, not by them, but by the turbine which drives them. The lighting is said to be brilliant, but there are several inconveniences attending it. In the first place, the lamps (even those of the private consumers) are either all alight or all out at the same time. Then there have been some rather untimely extinctions; while occasional variations in the luminous intensity of the lamps have testified to certain irregularities in connection with the machinery. Leaving these out of consideration, M. Dumont may be said to have succeeded fairly well in lighting a town by electricity generated by the aid of natural forces. He hopes, however, to go beyond this, and afford, by means of electric cables, a supply of power to those works whose proprietors may be willing to take it of him.

—— The Consolidated Electric Light Company, of Maine, held its annual meeting in Portland last Friday. There was a good attendance, including stockholders from Boston, Lowell and Lewiston. A favorable showing of the progress for the past year, and the present condition of the company, was made by the president. The following officers were elected for the ensuing year:

President—George A. Thomas.
Vice-President—Franklin J. Rollins.
Treasurer—F. A. Sawyer.
Clerk—Clarence Hale.
Directors—Geo. A. Thomas, F. J. Rollins, W. A. Cromwell, Silas Gurney, Edward H. Goff, Clarence Hale, F. A. Sawyer, Abel Wheeler, Wm. M. Wood.

FIG. 1

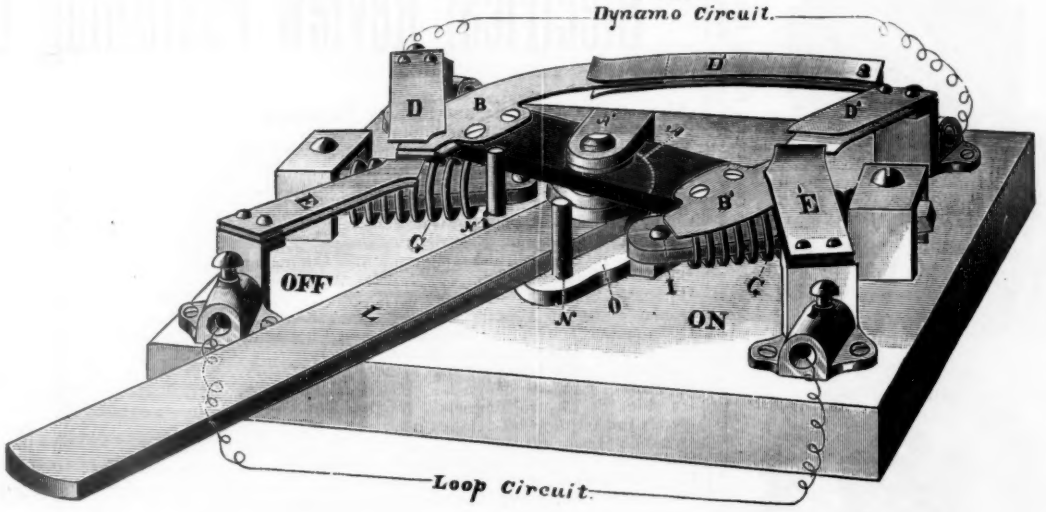
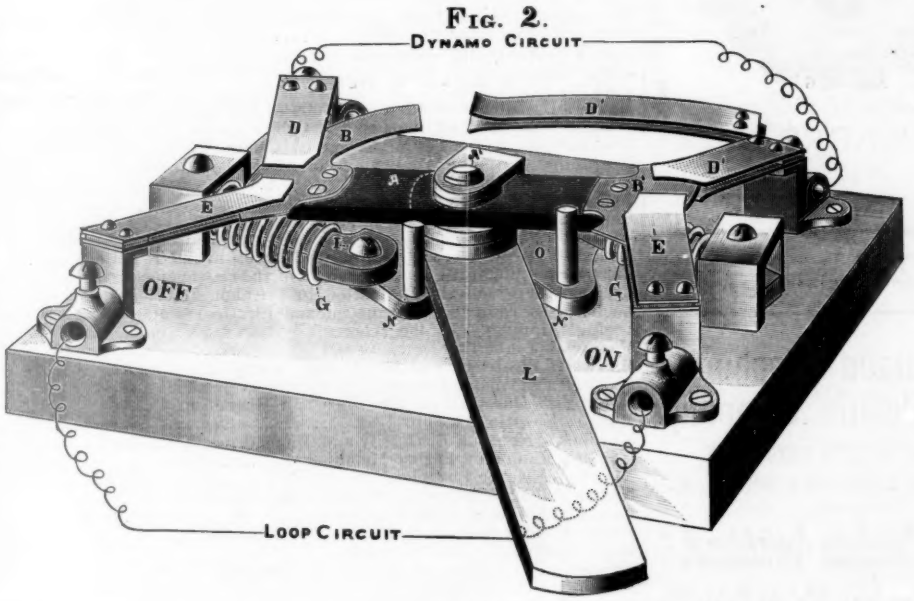


FIG. 2.



ELECTRIC LIGHT NEWS

—— The St. John Electric Light Company, St. John, N. B., are setting two tubular boilers with the Jarvis Patent furnace to burn Nova Scotia soft coal screenings.

—— Dr. Elroy M. Avery has organized a Brush-Swan Electric Light Company in Ithaca, N. Y.; capital, $50,000. Directors are Henry W. Sage, Wm. H. Gage, O. H. Gregory and Dr. Avery.

—— A new electric light company has been formed in San Antonio, Texas, with Ed. Braden, president; L. M. Gregory, secretary; and Peter Shields, treasurer. The company will turn on the light next Tuesday.

—— The electric light off Coasters' Harbor Island, owned by the Government, and on board the United States training ship New Hampshire, was lighted for the first time last Thursday night, and worked satisfactorily.

—— The Russell Paper Company have purchased another Armington & Sims engine, making ten engines of this make in their different paper mills. This engine is 12½"x20", and will be used to run a plant of Edison incandescent lamps at their paper mills in Bellows Falls, Vt.

—— The Thomson-Houston Electric Light Company, or rather the Connecticut District Telegraph and Electric Company, have seventy-nine arc lights running in Waterbury. The latter company have a district telegraph system at Meriden and Bridgeport, and have about 500 boxes rented in the two cities.

—— Two specimens of electric portable safety lamps were submitted to the inspection of the French Academy of Sciences recently by M. Jamin. One of the lamps starts alight on being grasped in the hand, and goes out by itself immediately it is laid down. The second safety lamp, on the contrary, which is devised especially for use by firemen and miners, will only light up and burn when laid down or suspended from the belt or head of the person using it.

—— Among recent experiments with the electric light, one of the most novel is that of the Director of Telegraphs at Haugesund, Norway, who has endeavored to ascertain its effect on attracting fish to places in the sea illuminated by it. Electric lamps have been especially constructed at Brussels for this purpose. These experiments, which have been quite successful, are in the line of similar ones conducted with other illuminating agents for several years past.

—— C. R. Mabley & Company, clothiers, Detroit, Mich., are increasing their plant of United States incandescent lights. Last spring they put in an outfit driven by two Westinghouse engines of respectively 65 and 8 horse-power each, and have now added another engine of the same make, of 45 horse-power, with corresponding dynamo capacity. The interior of their stores are lit on the Incandescent system and the outside fronts are brilliantly illuminated by arc lights on both sides of the street.

—— At Bangor, Maine, a company has been formed with a capital of $50,000, for establishing a central lighting station to supply the city and people with arc and incandescent electric lights, as well as electric motors for transmission of power. The company has closed a contract with the American Electric and Illuminating Company of Boston, for the immediate installation of a complete 100 arc light plant, with accompanying machinery for incandescent lights and motors. Real estate is to be purchased, and construction work commenced immediately.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 9, 1884.

308,890 Insulating electrical conductors and compound for coating the same; William D. Grimshaw, New York, N. Y., assignor to the Grimshaw Insulated Wire and Cable Manufacturing Company, same place.

308,897 Telegraph call box; Charles Hermann, New York, N. Y.

308,908 Means for electrically locating mineral veins; August P. Lighthill, Boston, Mass.

308,922 District telegraph signal box; William B. Palmer, Minneapolis, Minn., assignor of one-half to James C. Haynes, same place.

308,954 Electric wire supporter; Oscar M. Draper, North Attleborough, Mass., assignor, by mesne assignments, to himself and Albert Scranton Weaver and Oscar N. Bender, both of Providence, R. I.

308,956 Telephone transmitter; William H. Eckert, New York, N. Y., assignor to the American Bell Telephone Company, Boston, Mass.

308,979 Low water detector for steam boilers; John M Palmatier, New York, N. Y.

308,992 Electric battery; Isaiah L. Roberts, Brooklyn, N. Y., assignor of one-half to Henry L. Brevoort, same place.

309,000 Electric apparatus for setting clocks synchronously; John E. Smith, New York, N. Y., assignor to the Gold and Stock Telegraph Company, same place

309,001 Circuit controller for electric clocks on telephone and other lines; John E. Smith, New York, N. Y., assignor to the Gold and Stock Telegraph company, same place.

309,012 Electric arc lamp; Silvanus F. Van Choate, New York, N. Y.

309,064 Educational apparatus; Ira S. Kinch, New York, assignor of one-half to Thomas F. Attix, Brooklyn, N. Y.

309,091 Accessible underground conduit; Wm. K. Platt and George A. Aldrich, Philadelphia, Pa.

309,114 Electric gage; Charles D. Warner, Ansonia, Conn.

309,126 Telegraphy; Robert K. Boyle, Brooklyn, N. Y., assignor to himself, James M. Pendergast, Boston, Mass., and Daniel H. Craig, New York, N. Y.

309,167 Adjustable resistance for electrical circuits; Frank J. Sprague, New York, N. Y., assignor to Samuel Imsull.

RE-ISSUES.

10,542 Printing telegraph; Frank L. Pope, Elizabeth, and Thomas A. Edison, Menlo Park, N. J., assignors, by mesne assignments, to the Gold and Stock Telegraph Company, New York, N. Y.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40.00. Various other Foreign patents may also be obtained.

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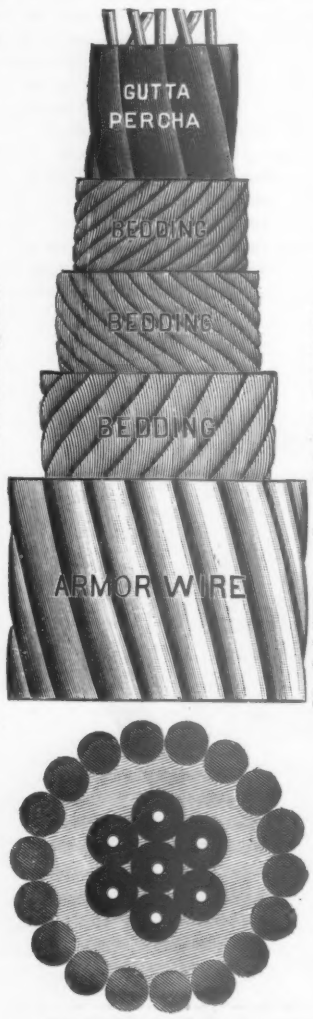

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